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EM 691-851:Cost Estimating Capital Projects

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September 1st, 2020

New Jersey Institute of Technology Newark Campus

Course Syllabus: **EM 691 Cost Estimating Capital Projects**

Course Information

Course: **EM 691 Capital Estimating**

Quarter: **Fall 2020**

Module: **Online**

September 2020- December 2020

Prof. **Cesar Jaramillo**

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Office Hours: **By Appointment only**

Course Description

The objectives of this course are to identify and develop skills necessary to be a successful Project Controls Manager with special focus on a critical components of Project Controls; Estimating. Capital Estimating is a set of skills requiring principles, methods, and techniques and mechanisms that are used to effectively estimate a project from the concept to completion including design, engineering, and procurement, construction, testing, commissioning and close out.

This course is based on of the instructor's Engineering and Management **international** experience in the field of Chemical Engineering, Project Engineering and Project Controls in South America and USA.

Subject to Change based on Instructor and Student Needs

Readings

Required Reading:

- Cost Estimator's Reference manual by Stewart, Wyskida, Johannes
- Controls & Management of Capital Projects by John W Hackney
- Project Planning Scheduling & Controls: A Hands-On Guide to Bringing projects in On Time and on Budget by James P. Lewis
- Skills & Knowledge Track Workbook of Cost Engineers sponsored by AACE

Suggested Reading:

- The Selection Process for Capital Projects by Hans J. Land & Donald N. Merino
- Project Management- A Systems approach to Planning, Scheduling and Controlling by Harold Kerzner, P.Hd
- Project Management- A Managerial approach by Jack. R. Meredith & Samuel J. Mantel, Jr.
- AACE sponsored Papers and Manuals

Supporting Bibliography:

Engineering Economy (W/Bind-in Access Code) 16th edition

ISBN# 9780133439274

By Sullivan

Course Requirements

Each student is expected to:

- (1) Monitor daily Moodle account and the school email account
- (2) Complete assignments on time
- (3) Prepare, participate and be proactive in your online class discussions
- (4) Participate in online group exercises
- (5) Satisfactorily prepare for & pass the midterm and final examination

Subject to Change based on Instructor and Student Needs

(6) Understand and grasp all knowledge from Power Point Presentations and supplementary assignments

(7) Prepare a successful final presentation by combining all knowledge learned during the semester

Instructional Approach

- **In addition to the Power Point contents, additional content information will be uploaded for EACH session to reinforce the learning process.**
- The class will involve lectures, online discussions, online group exercises, quizzes, exams and a final presentation. Grading Rubric - Final grade will be based on the following:
 - 20% Online Participation including completion of assignments
 - 10% Summary (1st part of the semester)
 - 10% Summary (2nd part of the semester)
 - 15% Midterm examination
 - 15% Final examination
 - 30% Final Power Point Presentation

General Outline and Assignments (the sequence may change)

Session 1: Capital Estimating 1

Student's introductions

Overview of the project cycle

Review of the case study

Glossary

Types of estimates

Factored estimate ($C_{new} = C_{old} * (C_{new}/C_{old})_n$)

Software used for estimation

Details of direct/indirect costs

Productivity

Sample template

Assignment for the next session

Session 2: Capital Estimating 2

Estimating chart

Material take offs

Direct/Indirect costs

Engineering
Effects of escalation, Inflation, CPI,
Productivity
Sample estimate

Session 3: Capital Estimators Responsibilities

Technical requirements
Impact of prevailing market conditions
Basis- Assumptions
Front End Loading (FELs)
Engineering
Cost Elements
Communication

Session 4: Project Life Cycle (23) and Capital Estimating & FEL (18)

What is FEL
- Site factors
- Engineering
- PEP (Project Execution Plan)
Sources of input for estimates
Ten estimating observations for business professionals
Estimating class exercise

Session 5: Home Assignment: Value Engineering

Value Eng:
History
Types
Phases of
Selection of

Session 6: Contracting Strategy & Estimating

What is a contract?
Contracting Strategies
Successful contracting
Major Types of Contracts
Typical contents of a Contract
Criteria to select the type

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Key Clauses
Breach of Contract
Claims & Dispute resolution

Session 7: Estimate Organization & Ranges

Importance and advantages of a range of estimates
Types
Organization
Following typical standards
Single point or ranges
Reasons for different types of estimates and their justification
Responsibilities & Accountability

Session 8- Oct 12 : Home Assignment: Code of Account

A bridge between cost, estimating and scheduling
Facilitates information
Principals of COA
Essential for internal/external communication
A typical example

Mid term: Midterm exam (contents to be covered will be mentioned a week before on Moodle)

Session 9: Procurement and Estimating

Definition
 Material
 Services
Methods & mechanism
Bids and bid waiver
Sole bidding

Session 10: Productivity

Productivity:
Definition
By countries, regions
Factors of high, low productivity

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Maslow's Hierarchy
How to increase

Session 11: Best Practices

Man-hours, Wage rates, Change management Process, Schedule

Session 12: International Project Estimating

P/L analysis
Investment risk due to local stability of government, fiscal policies,
local economy, culture and labor
Questions that an estimator should ask
Local Site conditions, Infrastructure,
Currency and its change
Local regulations

Session 13: Contingency & Risk Management

Definition
Risk & Contingency Identification
Risk Mitigation & Managements
General software used in Industry

Session 14: Contingency & Risk Management

Definition
Risk & Contingency Identification
Risk Mitigation & Managements
General software used in Industry

Session 15: Class Exercise

Case study and Group Assignment

Session 16: Professional Communication

Best Conversationalist is also the best listener
How to prepare for estimating reviews with management
How to communicate with difficult people

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How to listen and how not to listen
What to say & what not to say in an interview

Session 17: Nov 30th: Final Exam Summary and Final Project Presentation Assignments

Students will get individual Assignment Project to Prepare a Narrative Presentation (Research and Professional Communications Strategies are expected during narrative presentation)
Final Exam Content Summary Preparation

Session 18: Dec 7th : Final Exam and Final Presentation

Students uploading Final Project Narrative Presentations
Students completing Final Exams during this week.